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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/771,531	01/29/2001	Zheng J. Geng	80169-0028	9645

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EXAMINER

SEVER, ANDREW T

ART UNIT PAPER NUMBER

2851

DATE MAILED: 04/10/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/771,531

Applicant(s)

GENG, ZHENG J.

Examiner

Andrew T Sever

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-36 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1,2,4-6,9-12,18,20,21,23,24,27,29,30,33,34 and 36 is/are rejected.
- 7) ☒ Claim(s) 3,7,8,13-17,19,22,25,26,28,31,32, and 35 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Drawings

1. Figures 1, 2, 3, 4, 5A, and 5B should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). **A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.**

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 18 and 27 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. The term "bimorpher material" is not an art recognized material and the specification does not teach what specifically one is only what one does in the present invention. Since it is described in the same manner as the electromagnetic actuator of claim 19, either claim 19 is a duplicate of claim 18 or a "bimorpher material" is not an electromagnetic actuator. The examiner assumes the later is the case and therefore claim 18 and claim 27 are not enabled by the specification. Since a search for the term "bimorpher material" did not result in any relevant prior art to clarify what is being claimed, claims 18 and 27 are not clear and will not be further

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searched in the prior art, since one with ordinary skill in the art would not know what a "bimorpher material" is or be able to obtain it to reproduce the claim invention.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1, 2, 4-6, 9, 10, 20, 21, 29, 30, and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Geng (US 5,675,407) in view of Ross et al. (US 4,648,717).

Geng ('407) teaches a device for creating a three-dimensional profile of an object or scene being imaged. The device comprises a light source (1) for illuminating the object or scene (6) with a light pattern produced by a linear variable wavelength filter (as is claimed by applicant's claims 9, and 10), which varies across the object or scene which consists of red, green, and blue as is claimed by applicant's claim 6 or alternatively can be in the infrared or ultraviolet ranges as taught in column 5 lines 39-43 and as applicant claims in claims 4 and 5, an image sensor (4) for imaging the object or scene (6), and a processor (inherent) for calculating a distance to a point on the object or in the scene based on a baseline distance between the light source and the camera, an angle between the camera and the baseline, and an angle at which light striking the point is emitted by the light source as determined from the characteristic of the light striking the point.

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Geng ('407') does not teach, however, that the light pattern has a characteristic that varies across the object or scene and includes two or more sub-patterns. Ross teaches in column 4 lines 25-62 a method of three-dimensional measurement that in one embodiment includes using a bi-directional pattern (such as shown in figure 6 or a checkerboard as taught in line 44). A bi-directional pattern consists for example of one pattern projected in a horizontal direction and a second pattern in a vertical (90 degree angle of the first as is claimed in applicant's claim 20.) Ross further teaches in lines 59-62 and elsewhere in lines 25-62 that this bi-directional pattern allows for an unambiguous registration and for unambiguously registering the 3-D co-ordinates of the three-collinear points that define the six degrees of freedom of 3-D space. Since this is beneficial and modifying Geng ('407') to produce a bi-directional pattern would not require extensive modification, it would be obvious to one of ordinary skill in the art at the time the invention was made to modify Geng ('407') to project a light pattern that varies across the object or scene and including two or more sub-patterns.

With regards to applicant's claims 2 and 21, Geng ('407') in view of Ross teaches a device that spatially varies wavelength with two or more sub-patterns (where one sub pattern is projected horizontally while a second is projected simultaneously vertically). Since Ross teaches that both sub-patterns are the same pattern just projected at different angles, obviously, a given wavelength of light reflecting off of the object can correspond to more than one projection angle (a vertical angle and a horizontal angle for example.)

With respect to applicant's claims 29, 30, and 36 the device taught by Geng ('407) in view of Ross a method for using it to create a three-dimensional profile of an object or scene with it is obvious and inherent.

Double Patenting

6. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

7. Claims 1, 2, 4-6, 9, 10, 20, 21, 29, 30, and 36 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 6 of U.S. Patent No. 5,675,407 in view of Ross et al. (US 4,648,717).

Geng ('407) teaches a device for creating a three-dimensional profile of an object or scene being imaged. The device comprises a light source (part a of claim 5) for illuminating the object or scene with a light pattern produced by a linear variable wavelength filter (as is claimed in claim 6), which varies across the object or scene in more than one dimension which consists of red, green, and blue (this is well known and supported by the specification although not specifically stated by the claim language) as is claimed by the current application's claim 6 or alternatively can be in the infrared or

ultraviolet ranges (those with ordinary skill in the art know it is common knowledge the infrared and ultraviolet light are also part of the light spectrum; just parts that humans can not see, further Geng's ('407) specification teaches that filters that work in either infrared or ultraviolet instead of visual are interchangeable with the visual ones which are assumed to be claimed and therefore it would be obvious to one of ordinary skill in the art at the time of the invention to use either infrared or ultraviolet) and as the current application claims in claims 4 and 5, an image sensor (part b of claim 5) for imaging the object or scene, and a processor (data extraction means, part d of claim 5) for calculating a distance to a point on the object or in the scene based on a baseline distance between the light source and the camera, an angle between the camera and the baseline, and an angle at which light striking the point is emitted by the light source as determined from the characteristic of the light striking the point.

Geng ('407') does not teach, however, that the light pattern has a characteristic that varies across the object or scene and includes two or more sub-patterns. Ross teaches in column 4 lines 25-62 a method of three-dimensional measurement that in one embodiment includes using a bi-directional pattern (such as shown in figure 6 or a checkerboard as taught in line 44). A bi-directional pattern consists for example of one pattern projected in a horizontal direction and a second pattern in a vertical (90 degree angle of the first as is claimed in applicant's claim 20.) Ross further teaches in lines 59-62 and elsewhere in lines 25-62 that this bi-directional pattern allows for an unambiguous registration and for unambiguously registering the 3-D co-ordinates of the three-collinear points that define the six degrees of freedom of 3-D space. Since this is beneficial and

modifying Geng ('407) to produce a bi-directional pattern would not require extensive modification, it would be obvious to one of ordinary skill in the art at the time the invention was made to modify Geng ('407) to project a light pattern that varies across the object or scene and including two or more sub-patterns.

With regards to the present application's claims 2 and 21, Geng ('407) in view of Ross teaches a device that spatially varies wavelength with two or more sub-patterns (where one sub pattern is projected horizontally while a second is projected simultaneously vertically). Since Ross teaches that both sub-patterns are the same pattern just projected at different angles, obviously, a given wavelength of light reflecting off of the object can correspond to more than one projection angle (a vertical angle and a horizontal angle for example.)

With respect to the present application's claims 29, 30, and 36 the device taught by Geng ('407) in view of Ross a method for using it to create a three-dimensional profile of an object or scene with it is obvious and inherent.

8. Claims 1, 2, 4-6, 9-12, 20, 21, 23, 24, 29, 30, 33, 34, and 36 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 6 of U.S. Patent No. 6,028,672 in view of Ross et al. (US 4,648,717).

Geng ('672) teaches a device for creating a three-dimensional profile of an object or scene being imaged. The device comprises a light source (part a of claim 5) for illuminating the object or scene with a light pattern produced by a linear variable wavelength filter (part a of claim 6), which varies across the object or scene in more than

one dimension which consists of red, green, and blue (this is well known and supported by the specification (column 4 lines 31 and 32) although not specifically stated by the claim language) as is claimed by the current application's claim 6 or alternatively can be in the infrared or ultraviolet ranges (those with ordinary skill in the art know it is common knowledge the infrared and ultraviolet light are also part of the light spectrum; just parts that humans can not see and it would be obvious to one of ordinary skill in the art at the time of the invention to use either infrared or ultraviolet when using light invisible to the naked eye would be useful) and as the current application claims in claims 4 and 5, an image sensor (part b of claim 5) for imaging the object or scene, and a processor (data extraction means, part e of claim 5) for calculating a distance to a point on the object or in the scene based on a baseline distance between the light source and the camera, an angle between the camera and the baseline, and an angle at which light striking the point is emitted by the light source as determined from the characteristic of the light striking the point. Geng ('672) further claims a calibration means (claim 5 part c) for obviously pre-distorting the light pattern based on pre-calibration characteristics of the image sensor as is claimed in the present application's claims 11, 23, and 33. Geng ('672) also claims (claim 5 part b) a second image sensor for working with the first image sensor in order to form a stereo pair as is claimed by the present application's claims 12, 24, and 34.

Geng ('672') does not teach, however, that the light pattern has a characteristic that varies across the object or scene and includes two or more sub-patterns. Ross teaches in column 4 lines 25-62 a method of three-dimensional measurement that in one

embodiment includes using a bi-directional pattern (such as shown in figure 6 or a checkerboard as taught in line 44). A bi-directional pattern consists for example of one pattern projected in a horizontal direction and a second pattern in a vertical (90 degree angle of the first as is claimed in applicant's claim 20.) Ross further teaches in lines 59-62 and elsewhere in lines 25-62 that this bi-directional pattern allows for an unambiguous registration and for unambiguously registering the 3-D co-ordinates of the three-collinear points that define the six degrees of freedom of 3-D space. Since this is beneficial and modifying Geng ('672) to produce a bi-directional pattern would not require extensive modification, it would be obvious to one of ordinary skill in the art at the time the invention was made to modify Geng ('672) to project a light pattern that varies across the object or scene and including two or more sub-patterns.

With regards to the present application's claims 2 and 21, Geng ('672) in view of Ross teaches a device that spatially varies wavelength with two or more sub-patterns (where one sub pattern is projected horizontally while a second is projected simultaneously vertically). Since Ross teaches that both sub-patterns are the same pattern just projected at different angles, obviously, a given wavelength of light reflecting off of the object can correspond to more than one projection angle (a vertical angle and a horizontal angle for example.)

With respect to the present application's claims 29, 30, and 36 the device taught by Geng ('672) in view of Ross a method for using it to create a three-dimensional profile of an object or scene with it is obvious and inherent.

Allowable Subject Matter

9. Claims 3, 7, 8, 13-17, 19, 22, 25, 26, 28, 31, 32, and 35 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

10. The following is a statement of reasons for the indication of allowable subject matter:

With regards to applicant's claims 3, 22, and 31 although Geng (in its many versions) in view of Ross does read on a device where the projected light pattern has multiple sub patterns, neither Geng nor Ross suggest that the processor restricts a search space for color matching in one of the sub-patterns. Rather the Geng references are devoted to single pattern projection systems whereas, the Ross patent teaches multiple sub-patterns that are based on patterns other than color. One with ordinary skill in the art would not automatically, when combining the Geng and Ross patents as described above, produce a processor that determines the projection angle for the given wavelength via adaptive initial point calculation. Since the prior art of record did not suggest this elsewhere, claims 3, 22, and 31 would be allowable if written in independent form including the subject matter of claims 1 and 2; 21 and 20; 30 and 29 respectively.

With regards to applicant's claims 7, 8, 13, 14, 15, 16, 17, 19, 25, 26, 28, 32, and 35 applicant claims that the sub-patterns have varying intensities with each sub-pattern having a high point and a low point and that these varying intensities are achieved in various means such as slots and electromagnetic shutters. Although it is well known to use the reflected intensities along with the color of light to calculate the three-dimensional profile of an object or scene, the prior art of record does not teach using a projected light with a varying wavelength and intensity across the beam. Since this technique was not found it would not be obvious to incorporate the

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parts necessary to do the effect (such as the slots of claim 16) either. Since the prior art does not teach using two sub patterns that consists of both a sub-pattern of colors and a sub-pattern of intensities, claims 7, 8, 13, 14, 15, 16, 17, 19, 25, 26, 28, 32, and 35 would be allowable if re-written to include the subject matter of their rejected base claims and any intervening rejected claims that they are dependent on.

Conclusion

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

US 6,252,623 to Lu et al. Teaches a method of three dimensional imaging that uses many of the claimed methods, however Lu does not use angle, rather, Lu already knows the distance to the object and uses phases to determine the shape of the object.

US 6,147,760 to Geng. Could also be used in an Obviousness type double patenting type rejection.

US 6,341,016 to Malione does many similar things to the claimed invention.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Andrew T Sever whose telephone number is 703-305-4036. The examiner can normally be reached M-F 8:30-5:00.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Russell Adams can be reached at 703-308-2847. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9318 for regular communications and 703-872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

AS
April 5, 2003


RUSSELL ADAMS
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800